

What is claimed is:

- 1 1. A restraining and protecting apparatus for a vehicle
- 2 occupant comprising:
  - 3 a seat belt (3) to restrain a vehicle occupant on a seat;
  - 4 a belt adjusting unit (12) to adjust a state in which said
  - 5 vehicle occupant is restrained using said seat belt (3) by
  - 6 increasing or decreasing said seat belt (3) to be drawn out in
  - 7 length;
  - 8 a belt locking mechanism (17) to prevent said seat belt (3)
  - 9 from being drawn out by locking said seat belt (3);
  - 10 an "immediately before collision" signal producing section
  - 11 (11) to produce and output an "immediately before collision"
  - 12 signal immediately before occurrence of a collision of said
  - 13 vehicle;
  - 14 a locking signal producing section (18) to produce and
  - 15 output a locking signal when it is predicted at least that said
  - 16 belt locking mechanism (17) is in a lockable state where
  - 17 inhibition of drawing out is made possible when said seat belt
  - 18 (3) is going to be drawn out;
  - 19 a controlling section (24) to control said belt adjusting
  - 20 unit (12) based on said "immediately before collision" signal
  - 21 to be input and said locking signal to be input; and
  - 22 wherein said controlling section (24) exerts control in a
  - 23 manner that, when said "immediately before collision" signal is
  - 24 input, said belt adjusting unit (12) increases said state in which
  - 25 said vehicle occupant is restrained using said seat belt (3) and
  - 26 that, when said locking signal is not input, said belt adjusting
  - 27 unit (12) weakens said state in which said vehicle occupant is

28 restrained using said seat belt (3).

1 2. The restraining and protecting apparatus for a vehicle  
2 occupant according to Claim 1, wherein said belt locking mechanism  
3 (17) in said lockable state, when said belt adjusting unit (12)  
4 is controlled by said controlling section (24) so as to increase  
5 said state in which said vehicle occupant is restrained using said  
6 seat belt (3), is put in a state of releasing locking in which  
7 said seat belt (3) is able to be drawn out.

1 3. The restraining and protecting apparatus for a vehicle  
2 occupant according to Claim 1 or Claim 2, wherein said controlling  
3 section (24) exerts control so that, while said locking signal  
4 is input, said belt adjusting unit (12) increases and maintains  
5 said state in which said vehicle occupant is restrained using said  
6 seat belt (3).

1 4. The restraining and protecting apparatus for a vehicle  
2 occupant according to Claim 3, wherein said controlling section  
3 (24) exerts control so that said belt adjusting unit (12), when  
4 a predetermined time has elapsed after said locking signal has  
5 been input, weakens said state in which said vehicle occupant is  
6 restrained using said seat belt (3).

1 5. The restraining and protecting apparatus for a vehicle  
2 occupant according to any one of Claim 1 to Claim 4, wherein said  
3 controlling section (24) exerts control when said "immediately  
4 before collision" signal is input so that said belt adjusting  
5 unit (12) increases said state in which said vehicle occupant is

6 restrained using said seat belt (3) and that said belt adjusting  
7 unit (12), said state in which said vehicle occupant is restrained  
8 using said seat belt (3) is changed to a state in which said vehicle  
9 occupant is restrained to a predetermined extent and when said  
10 locking signal is not input, weakens said state in which said  
11 vehicle occupant is restrained using said seat belt (3).

1 6. The restraining and protecting apparatus for a vehicle  
2 occupant according to any one of Claim 1 to Claim 5, wherein said  
3 locking signal producing section (18) outputs said locking signal  
4 when at least part of conditions under which drawing of said seat  
5 belt (3) is inhibited by said belt locking mechanism (17) is met.

1 7. The restraining and protecting apparatus for a vehicle  
2 occupant according to Claim 6, wherein said seat belt (3) is locked  
3 under condition that acceleration in a back-and-forth or lateral  
4 direction of said vehicle exceeds a predetermined value.

1 8. The restraining and protecting apparatus for a vehicle  
2 occupant according to Claim 6, wherein said seat belt (3) is locked  
3 under condition that acceleration at which said seat belt (3) is  
4 drawn out exceeds a predetermined value.

1 9. The restraining and protecting apparatus for a vehicle  
2 occupant according to Claim 7 or Claim 8, wherein said  
3 acceleration includes acceleration in a direction being reverse  
4 to a direction of a velocity of said vehicle.

1 10. The restraining and protecting apparatus for a vehicle

2 occupant according to any one of Claim 1 to Claim 5, wherein said  
3 locking signal producing section (18), when a state in which said  
4 belt locking mechanism (17) is in a lockable state is detected,  
5 outputs said locking signal.

1 11. The restraining and protecting apparatus for a vehicle  
2 occupant according to any one of Claim 1 to Claim 10, wherein said  
3 belt adjusting unit (12) has a motor to retract said seat belt  
4 (3) and wherein said controlling section (13), where said  
5 "immediately before collision" signal is input, controls said  
6 motor to increase its driving power and to increase said state  
7 in which said vehicle occupant is restrained using said seat belt  
8 (3) and exerts control so that, said belt adjusting unit (12),  
9 when said locking signal is not input, weakens said state in which  
10 said vehicle occupant is restrained using said seat belt (3).

1 12. The restraining and protecting apparatus for a vehicle  
2 occupant according to Claim 11, wherein said controlling section  
3 (13), while said locking signal is input, controls said motor  
4 serving as said belt adjusting unit (12) so as to have said seat  
5 belt (3) retracted.

1 13. The restraining and protecting apparatus for a vehicle  
2 occupant according to any one of Claim 1 to Claim 12, wherein said  
3 "immediately before collision" signal producing section (11),  
4 based on a detection signal obtained from a non-contact type  
5 distance sensor, calculates a speed of said vehicle relative to  
6 an obstruction existing in a front of said vehicle and, based on  
7 a result from calculation, judges as to whether there is a

8 possibility of occurrence of collision between said vehicle and  
9 said obstruction and also judges, when there is a possibility of  
10 collision, as to whether said avoidance of collision is possible  
11 or not.

1 14. The restraining and protecting apparatus for a vehicle  
2 occupant according to any one of Claim 1 to Claim 13, wherein said  
3 "immediately before collision" signal producing section (11),  
4 when a detection of an operation for collision avoidance is made,  
5 outputs said "immediately before collision" signal.

1 15. The restraining and protecting apparatus for a vehicle  
2 occupant according to Claim 14, wherein said "immediately before  
3 collision " signal producing section (11) outputs said  
4 "immediately before collision" signal when detection of a rapid  
5 brake operation or a rapid handle operation for collision  
6 avoidance is made by being recognized that acceleration in a  
7 back-and-forth or lateral direction of said vehicle exceeds a  
8 predetermined value.